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Kristiansen, Dorte Melgaard; Baandrup, Ulrik; Bøgsted, Martin; Bendtsen, Mette Dahl; Hansen, Tina

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Rehospitalisation and mortality after hospitalisation for orapharyngeal dysphagia and community-acquired pneumonia: A 1-year follow-up study

Dorte Melgaard[1,2]*, Ulrik Baandrup[1,2], Martin Bøgsted[2,3], Mette Dahl Bendtsen[2,3] and Tina Hansen[4]

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*Corresponding author: Dorte Melgaard, Center for Clinical Research, North Denmark Regional Hospital, Hjørring, Denmark; Department of Clinical Medicine, Aalborg University, Aalborg, Denmark
E-mail: dmk@rn.dk

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Abstract: Research has documented a high prevalence of oropharyngeal dysphagia (OD) in older patients with community-acquired pneumonia (CAP). This study investigated OD as a risk factor for long-term re-hospitalization and mortality in patients hospitalized with CAP. A total of 36 patients (72.2% male, mean age 80.9 years) who were alive 30 days after discharge were included in the follow-up study. Demographic data, CURB65, Charlson Comorbidity Index, Modified Rankin Scale and Barthel-20 score were recorded and OD was assessed with Volume Viscosity Swallow Test. 69.5% of the patients were moderately to severely disabled, and the mean Barthel-20 score was 13.2 and 27.8% lived in nursing homes. In the period from 31 to 180 days 50% of the patients were re-hospitalized and from 181 to 360 days 60.7% were re-hospitalized. Re-hospitalized patients had a significantly higher Barthel-20 score and longer length of stay (LOS) in the hospital. During 31–180 days after discharge 22.2% of the patients died. From 181 to 360 days after discharge 46.4% of the patients died, they had a significantly higher Charlson Comorbidity Index and a significantly weaker handgrip. The one-year mortality was 71.7%. Despite the small sample size, this study confirms a high re-hospitalisation frequency and high mortality. The 1-year mortality is 71.7% for patients hospitalised with CAP and OD.

Subjects: Medicine; Gerontology; Infectious Diseases; Clinical Nutrition; Nursing

Keywords: dysphagia; pneumonia; aged; risk factor; frailty

ABOUT THE AUTHORS

Dorte Melgaard is Research Coordinator, PhD, postdoctoral fellow at the North Denmark Regional Hospital and the chairman for the Danish Society of Swallowing Disorders.

Ulrik Baandrup, professor emeritus and consultant pathologist; Cardiovascular and Pulmonary pathology.

Martin Bøgsted is professor of bioinformatics and statistics at Aalborg University and senior biostatistician at Aalborg University Hospital.

Mette Dahl Bendtsen, MSc Statistician at Aalborg University Hospital contributing with statistical analyses on various research projects.

Tina Hansen is Associate professor at the Division of Physical and Occupational Therapy at the Metropolitan University College in Denmark.

PUBLIC INTEREST STATEMENT

Pneumonia is a leading cause of hospitalization and death especially among elderly patients. Elderly people get pneumonia four times as often as young people do and elderly people are more likely to be hospitalized than young people. It is well known that elderly people with swallowing disorders who are choking during meals are in high risk of aspiration and pneumonia caused by aspiration.

The present study documents that patients hospitalized with pneumonia and swallowing disorders are in high risk of rehospitalization. More than seven out of ten patients with pneumonia and swallowing disorders are dead within 12 months.

1. Introduction

Community-acquired pneumonia (CAP) is a common and severe cause of admission, readmission and death among elderly adults (Almirall et al., 2000; Klausen et al., 2012; Vila-Corcoles et al., 2009).

Old age is the main risk factor for CAP (Klausen et al., 2012; Loeb, McGeer, McArthur, Walter, & Simor, 1999) and as the senior population increases, the number of patients with CAP expands (Thomsen et al., 2006). Other factors predispose older adults to CAP such as poor functional and nutritional status, weight loss, comorbidity, and deterioration of swallowing function (Jackson, Nelson, & Jackson, 2009; Loeb et al., 2009; Manabe, Teramoto, Tamiya, Okochi, & Hizawa, 2015; Torres, Peetermans, Viegi, & Blasi, 2013). The 1-year mortality in patients with CAP ranges from 7.2 to 41% (Adamuz et al., 2014; Johnstone, Eurich, Majumdar, Jin, & Marrie, 2008; Juthani-Mehta et al., 2013; Restrepo, Faverio, & Anzueto, 2013). Reported risk factors for death are chronic obstructive pulmonary disease (COPD), and living in nursing homes (Holter et al., 2016). Readmission 31 days or more after pneumonia are not well-described (Prescott, Sjoding, & Iwashyna, 2014) but studies found an assessed cumulative readmission rate beyond 30 days of 22–35.6% (Bohannon & Maljanian, 2003; Hedlund, 1995) and 46% after 12 months (Johnstone et al., 2008).

The prevalence of swallowing disorders also increases with age, and a high prevalence has been reported and ranges from 34 to 86% in older patients hospitalised for pneumonia (Almirall et al., 2013; Cabre et al., 2010; Melgaard, Baandrup, Bogsted, Bendtsen, & Hansen, 2016; Teramoto et al., 2008). It is well known and accepted that oropharyngeal dysphagia (OD) is a risk factor for aspiration pneumonia in older adult patients, especially in those living in nursing homes (Marik, 2003; van der Maarel-Wierink, 2011). OD and frailty are closely related, and older frail people are at high risk for aspiration pneumonia (Carrión et al., 2015; Rofes et al., 2010; Wirth et al., 2016). Patients with OD have a 1-year mortality rate of 51.7–65.8% (Carrión et al., 2015; Rofes et al., 2010) and increased risk of re-hospitalisation (Cabre et al., 2014), but the risk factors for re-hospitalisation and death are often not addressed in the literature.

The aim of this study was to characterize patients with CAP and OD, who were rehospitalised or dead after hospitalisation. Further, this study intended to determine whether OD among patients consecutively hospitalised with CAP is a risk factor for readmission and mortality 31–180 days and 181–360 days after discharge.

2. Material and methods

2.1. Study design

From 1 September 2013, to 31 March 2014, a cross-sectional study with longitudinal follow-up enrolled 170 patients hospitalised with pneumonia at the Department of Respiratory Medicine in the North Denmark Regional Hospital. Details of recruitment, study design and methods have been described elsewhere (Melgaard et al., 2016). The inclusion criteria were patients over 18 years, a temperature above 38°C, a new infiltrate on chest x-ray, increased C-Reactive Protein (CRP), and one of the clinical criteria: cough, dyspnea, pleuritic chest pain, expectoration, or tachypnea. The included patients were diagnosed with CAP and OD.

2.2. Measures

During hospitalisation, the following data were obtained:

Patient characteristics in terms of age, gender, admission date, and discharge date.

Medical information in terms of temperature, urea, CRP, respiratory rate, blood pressure by hospitalisation, confusion as well as medication by discharge was obtained.

Nutritional status was assessed by body mass index (BMI), circumference of the lower leg (15 cm above the lower edge of the patella), circumference of the upper arm (lateral epicondyle + 10 cm),

and circumference of the waist (2 cm above the navel). Also, data of the level of oral health and hand strength (measured by the Jamar Hand Dynamometer) were collected.

The severity of pneumonia was assessed by the CURB65, which is used as a part of the usual routine assessment by the physician to describe (Capelastegui et al., 2006; Lim et al., 2003). The CURB65 score consists of five factors: confusion, urea, respiratory rate, blood pressure, and age 65 years or older. Each factor scores one point on a scale of a score of 0–5 points.

Comorbidity was assessed with the Charlson Comorbidity Index (CCI) (Charlson, Szatrowski, Peterson, & Gold, 1994), which consists of 19 disease groups. Each group has a significant mortality risk like cancer, COPD, or myocardial infarct; the higher the score, the higher the risk of mortality.

The functional level before hospitalisation was assessed with the Modified Rankin Scale (MRS). The patients reported their level of indoor, outdoor, and during shopping walking ability from the week before being hospitalised. Each activity was scored from 0 to 3 and cumulated to a score between 0 and 9, with high scores indicating a high level of activity (Kristensen, Bandholm, Foss, Ekdahl, & Kehlet, 2008).

Barthel-20 was used to assess performance in daily activities and mobility. A higher score is associated with a higher independence in daily living (Mahoney & Barthel, 1965).

OD was assessed by a trained occupational therapist using the Volume-Viscosity Swallow Test (V-VST). The test is designed to evaluate the safety of the swallow (changes in voice, cough or decrease in oxygen saturation ≥ 3%) to detect silent aspiration and the efficiency of the swallow (impaired labial seal, oral or pharyngeal residue or piecemeal deglutition) when ingesting different types of viscosity and different volumes (Clavé et al., 2008). Bolus volume was 5, 10, and 20 ml. Bolus viscosity was liquid viscosity, nectar viscosity was created by adding 1.2 g of the thickener Resource ThickenUp (Nestlé HealthCare Nutrition) to 100 ml water, and pudding viscosity was created by adding 6.0 g of the thickener Resource ThickenUp to 100 ml water. Mineral water at room temperature 25°C was used.

After hospitalisation, data on the main outcomes readmission and mortality within 31–180 days and 181–360 days after discharge were obtained from the National Patient Register. In this study rehospitalisation was limited to the Northern Region of Denmark.

According to Danish legislation, this study not being an intervention study did not need approval by the North Denmark Region Committee on Health Research Ethics (N-20130058). The study was approved by the Danish Data Protection Authority (2008-58-0028).

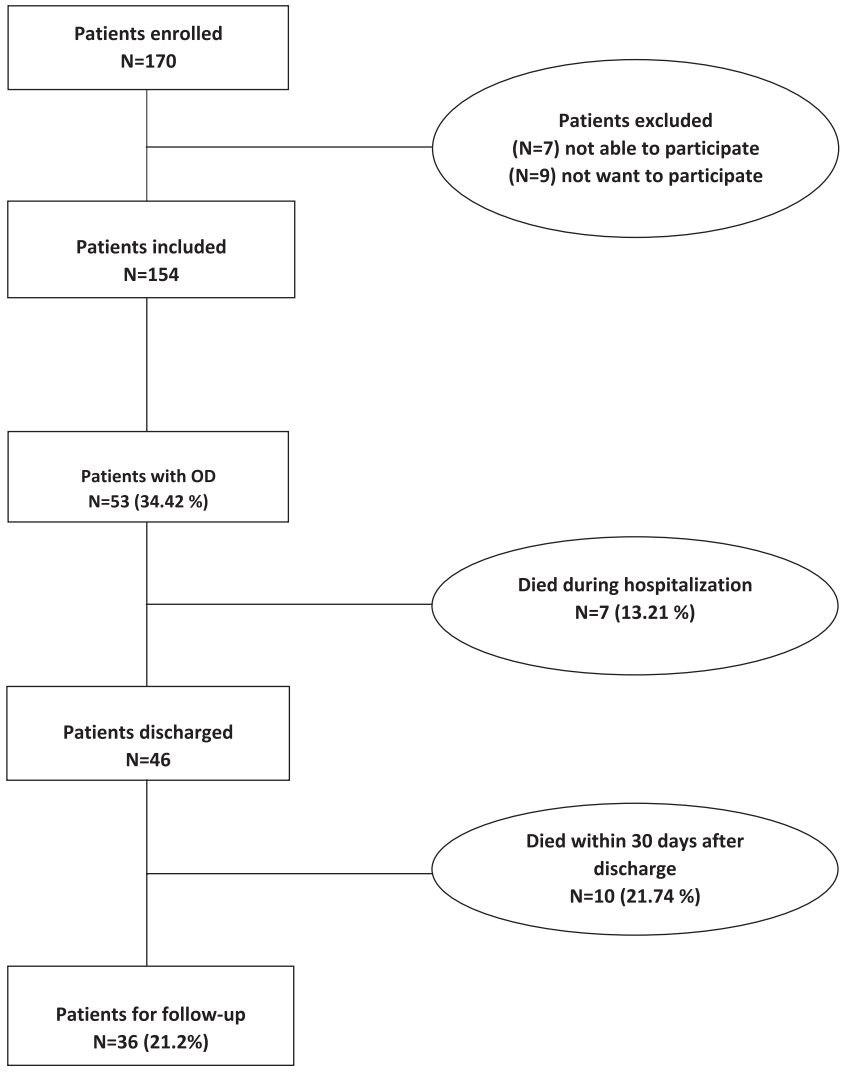
2.3. Statistical analysis

Descriptive statistics included the number and percentage of patients for categorical variables, and the mean for continuous variables. Differences between the two groups of rehospitalised/not rehospitalised and death/alive were analyzed using Fisher's Exact Test for categorical variables, and a two-sample t-test for continuous variables. The variables of handgrip and BMI were not normal distributed, and are reported with a median (IQR) and analyzed with the Wilcoxon Rank Sum Test. The statistical analyses were performed with Stata Version 13.1 (Stata Corporation, College Station, TX, USA), and throughout the analyses 95% confidence intervals (CI) were reported and a p-value < 0.05 was considered statistically significant.

3. Results

As illustrated in Figure 1, 30 days after discharge, 36 patients (72.2% male, mean age 80.9 years (SD ± 10.5)) with OD were alive and followed for 360 days. As seen in Table 1, the group of 36 patients was characterized by a relatively high mean age with many living in nursing homes (27.8%).

Figure 1. Flowchart of included patients (*N* = 170).



Further, 42.9% suffered from COPD. 69.5% of the patients were moderately to severely disable and the mean Barthel-20 score was 13.3.

3.1. Readmission

As illustrated in Table 2, 18 (50%) of the patients were re-hospitalised 31–180 days after discharge. This group of patients was characterized by a significantly higher Barthel-20 score, which indicated a higher functional level. As illustrated in Table 2, there were non-significant differences between the groups regarding the other parameters. The group of re-hospitalised patients had a lower frequency of dementia, and the patients had a 2.5 days Length of stay (LOS) in the hospital.

In the period between 181 and 360 days, 17 (60.7%) were rehospitalised. Characteristics of these patients were a significantly higher Barthel-20 score, and concerning other parameters, the difference was non-significant. The rehospitalised patients had a 1.7 day longer LOS than patients not rehospitalised.

Table 1. Baseline demographics and clinical characteristics

	***N* = 36 (34.4%)**
Gender—male	26 (72.2%)
Age—mean	80.9 (±10.5)
<50	0
50–69	6
70–79	9
80–	21
Point of origin	
House/apartment	26 (72.2%)
Nursing home	10 (27.8%)
Civil status	
Married/living together	28 (52.8%)
Single	25 (47.2%)
Rentier	100%
CURB65	
Confusion (yes)	15 (44.1%)
Urea (carbamide > 7 mmol/L)	24 (70.6%)
Respiratory rate ≥ 30/min	5 (15.2%)
Blood pressure <90 mm Hg syst or ≤60 mm Hg diast	63 (8.8%)
≥65 years	32 (88.9%)
CURB65—mean	2.34 (0.9)
0	0 (0%)
1	3 (9.1%)
2	21 (63.6%)
3	7 (21.2%)
4	1 (3.0%)
5	1 (3.0%)
Charlson Comorbidity Index	
Mean	5.5 (±1.6)
Comorbidity	
Dementia	7 (20.0%)
COPD	15 (42.9%)
Diabetes	3 (8.6%)
Hemiplegic	4 (11.4%)
CRP	95.25 (82.4)
Smoker	
Smoker	7 (19.4%)
Former smoker	17 (47.2%)
Never smoked	6 (16.7%)
Unknown	6 (16.7%)
Use of oxygen	
Yes	3 (8.3%)
No	29 (80.6%)
Unknown	4 (11.1%)
Modified Rankin Scale	

(*Continued*)

Table 1. (*Continued*)

	***N* = 36 (34.4%)**
No symptoms	1 (2.8%)
No significant disability	2 (5.6%)
Slight disability	6 (16.7%)
Moderate disability	9 (25.0%)
Moderately severe disability	11 (30.6%)
Severe disability	5 (13.9%)
Unknown	2 (5.6%)
Barthel-20	13.2 (±6.1)
Tooth status	
Denture upper jaw	6 (16.7%)
Denture under jaw	0 (0%)
Denture	15 (41.7%)
Unknown	5 (13.9%)
Oral health	
2 times per day	17 (47.2%)
1 time per day	11 (30.6%)
3–5 times per week	1 (2.8%)
1–2 times per week	0 (0%)
1 per month	0 (0%)
Never	2 (5.6%)
Unknown	5 (13.9%)
Weight	65.9 kg (±15.1)
Height	169.2 cm (±9.6)
BMI	22.7 (±5.2)
Waist line	101.2 (±13.0)
Circumference—under arm	26.2 (±4.5)
Circumference—under leg	31.9 (±5.1)
Hand grip right	13.6 (±12.0)
Medication by discharge	9.1 (±4.2)
Temperature by hospitalisation	37.9 kg (±0.9)

3.2. Mortality

During 31–180 days after discharge, 8 (22.2%) patients died. These patients were significantly older ($p = 0.008$) and most were male ($p = 0.076$) than patients who stayed alive. As seen in Table 3, there were no other significant differences between the two groups. From 181 to 360 days after discharge, 13 (46.4%) patients died. Patients who died in this period after discharge had a significantly higher Charlson Comorbidity Index ($p = 0.043$) and a significantly weaker handgrip ($p = 0.027$). There were no other significant differences between the two groups.

Of the 53 patients with OD and CAP, 38 were dead at follow-up, which gives a 1-year mortality rate of 71.7% (95%CI: 57.7; 83.2). For the 101 patients with only CAP, 20 were dead at follow up and the 1 year- mortality rate was 19.8% (95%CI: 12.5; 28.9).

Table 2. All causes of rehospitalisation within 31–180 days and 181–360 days after discharge

	31–180 days after discharge			181–360 days after discharge		
	Rehospitalised	Not rehospitalised	*p*-value	Rehospitalised	Not rehospitalised	*p*-value
	N = 18 (50%)	*N* = 18 (50%)		*N* = 17 (60.7%)	*N* = 11 (39.3%)	
Age						
Mean	80.6	78.4	0.528	78.5	76.1	0.574
	95% CI(75.5; 85.7)	95% CI(72.9; 83.8)		95% CI(73.1; 84.0)	95% CI(68.4; 83.7)	
<70y	2 (11.1%)	4 (22.2%)	0.658	3 (17.7%)	3 (27.3%)	0.653
≥70y	16 (88.9%)	14 (77.8%)		14 (82.4%)	8 (72.7%)	
Gender						
Male	12 (66.67%)	14 (77.8%)	0.711	11 (64.7%)	7 (63.6%)	1.000
Barthel-20	16.1	10.5	0.007	15.9	9.7	0.015
	95% CI (14.1; 18.2)	95% CI(7.1; 14.0)		95% CI(13.5; 18.3)	95% CI(5.3; 14.1)	
CURB65						
Mean	2.5[1]	2.1[2]	0.124	2.4[3]	2.0	0.137
	95% CI (2.0; 3.0)	95% CI (1.8; 2.4)		95% CI (2.0; 2.9)	95% CI (1.6; 2.4)	
0	0 (0%)	0 (0%)		0 (0%)	0 (0%)	0.707
1	1 (6.3%)	2 (11.8%)		1 (7.1%))	2 (18.2%)	
2	9 (56.3%)	12 (70.6%)		7 (50.0%)	7 (63.6%)	
3	4 (25.0%)	3 (17.7%)	0.683	6 (42.9%)	2 (18.2%)	
4	1 (6.3%)	0 (0%)		1 (7.1%)	0 (0%)	
5	1 (6.3%)	0 (0%)		0 (0%)	0 (0%)	
CCI	5.5	5.5	0.958	5.7	4.9	0.215
	95% CI (4.6; 6.4)	95% CI (4.7; 6.2)		95% CI (4.6; 6.7)	95% CI (4.1; 5.7)	
Dementia	2 (11.1%)	5 (29.4%)	0.228	2 (12.5%)	4 (36.4%)	0.187
Handgrip	8.5 (6.8–14.1)	13.7 (7–26)	0.632	8.5 (6.7–23.2)	7.3 (7.0–10.2)	0.991
Nursing home	5 (27.8%)	5 (27.8%)	1.000	4 (23.5%)	4 (36.4%)	0.671
MRS						
No symptoms.	0 (0%)	1 (5.6%)		1 (5.9%)	0 (0%)	
No significant disability.	1 (5.6%)	1 (5.6%)		1 (5.9%)	0 (0%)	
Slight disability	4 (22.2%)	2 (11.1%)		5 (29.4%)	1 (9.1%)	
Moderate disability	6 (33.3%)	3 (16.7%)		4 (23.5%)	3 (27.3%)	
Moderately severe disability	5 (27.8%)	6 (33.3%)		4 (23.5%)	3 (27.3%)	
Severe disability	1 (5.6%)	4 (22.2%)		1 (5, 9%)	3 (27.3%)	
Unknown	1 (5.6%)	1 (5.6%)	0.668	1 (5.9%)	1 (9.1%)	0.654
BMI	21.6 (16.6–27.2)	25.1 (21.4–26.7)	0.186	24.5 (21.4–25.6)	26.7 (25.1–28.0)	0.232
LOS	10.7	8.2	0.261	9.2	6.4	0.541
	95% CI (5.7; 14.9)	95% CI (4.8; 10.3)		95% CI (5.4; 14.9)	95% CI (4.4; 13.6)	

Note: CCI = Charlson Comorbidity Index, MRS = Modified Rankin Scale, BMI = Body mass index, LOS = Length of Stay.

[1]1 missing value.

[2]2 missing values.

[3]1 missing value.

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Table 3. All causes of mortality within 31–180 days and 181–360 days after discharge

	31–180 days after discharge			181–360 days after discharge		
	Alive	Dead	*p*-value	Alive	Dead	*p*-value
	N = 28 (77.78%)	*N* = 8 (22.2%)		*N* = 15 (53.57%)	*N* = 13 (46.43%)	
Age						
Mean	77.6	86.2	0.008	74.9	80.6	0.164
	95% CI (73.4; 81.7)	95% CI (81.2; 91.3)		95% CI (68.6; 81.3)	95% CI (89.7; 94.2)	
<70y	6 (21.4%)	0 (0%)	0.302	4 (26.7%)	2 (15.4%)	
≥70y	22 (78.6%)	8 (100%)		11 (73.3%)	11 (86.6%)	0.655
Gender						
Male	18 (64.3%)	8 (100%)	0.076	11 (73.3%)	7 (64.3%)	0.433
Barthel-20	13.4	12.8	0.822	15.5	13.2	0.889
	95% CI (11.0; 115.8)	95% CI (6.7; 18.8)		95% CI (10.0; 17.1)	95% CI (9.4; 17.0)	
CURB65						
Mean	2.2	2.4	0.744	2.1	2.5	0.192
	95% CI (1.9; 2.5)	95% CI (1.5; 3.3)		95% CI (1.7; 2.5)	95% CI (2.0; 2.9)	
0	0 (0%)	0 (0%)		0 (0%)	0 (0%)	
1	3 (12.0%))	0 (0%)		3 (21.4%))	0 (0%)	
2	14 (56.0%)	7 (87.5%)		7 (50.0%)	7 (63.6%)	
3	7 (28.0%)	0 (0%)		4 (28.6%)	4 (36.4%)	
4	1 (4.0%)	0 (0%)	0.364	0 (0%)	1 (9.1%)	
5	0 (0%)	1 (12.5%)		0 (0%)	0 (0%)	0.325
CCI	5.4	5.9	0.400	4.7	6.1	0.043
	95% CI (4.7; 6.1)	95% CI (4.7; 7.0)		95% CI (4.1; 5.4)	95% CI (4.9; 7.3)	
Dementia	6 (22.2%)	1 (12.5%)	1.000	2 (14.3%)	4 (30.7%)	0.385
Handgrip	8.3 (7.0–17.4)	12.1 (10.8–16.2)	0.580	17.3 (8.3–26.0)	6.7 (2.2–7.3)	0.039
Nursing home	8 (28.6%)	2 (25.0%)	1.000	4 (26.7%)	4 (30.8%)	1.000
MRS						
No symptoms	1 (3.6%)	0 (0%)		1 (6.7%)	0 (0%)	
No significant disability	1 (3.6%)	1 (12.5%)		0 (0%)	1 (7.7%)	
Slight disability	6 (21.4%)	0 (0%)		5 (33.3%)	1 (7.7%)	
Moderate disability	7 (25.0%)	2 (25.0%)		2 (13.0%)	5 (38.5%)	
Moderately severe disability	7 (25.0%)	4 (50.0%)		5 (33.3%)	2 (15.4%)	
Severe disability	4 (14.3%)	1 (12.5%)		2 (13.3%)	2 (15.4%)	
Unknown	2 (7.2%)	0 (0%)	0.615	0 (0%)	2 (15.4%)	0.143
BMI	25.1 (21.4–27.2)	17.9 (16.8–18.5)	0.225	25.1 (21.8–27.2)	21.4 (18.2–27.4)	0.764
LOS	7.9	9.8	0.571	9.2	6.4	0.963
	95% CI (4.6;13.6)	95% CI (7.2;12.4)		95% CI (4.2;13.6)	95% CI (4.4;14.9)	

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4. Discussion

We wanted to characterize the group of patients who were rehospitalised or died in 31–180 days and 181–360 days after discharge. Another aim was to determine whether OD among patients consequentially hospitalised with community-acquired pneumonia (CAP) is a risk factor for readmission and mortality 31–180 days and 181–360 days after discharge.

The 53 patients with OD and CAP compared with the 101 patients with CAP alone, showed a significant difference regarding age, dementia, functional level before hospitalization, Barthel 20 score at hospitalization, handgrip strength, circumference of the lower leg, BMI and more were living in a nursing home (Melgaard et al., 2016).

Evidence shows that OD is a risk factor for rehospitalisation (Cabre et al., 2014; Melgaard et al., 2016), and this study confirms a high frequency of rehospitalisation in patients with CAP and OD. Our results document that patients who are rehospitalised have a significantly higher level of functioning as measured with Barthel-20 than patients not rehospitalised. This differs from studies showing that it is the weakest who are hospitalised with OD (Cabre et al., 2014; Melgaard et al., 2016) and therefore it would be expected that the weakest group were more often readmitted. This finding may indicate the doctor's delay to admit elderly, frail patients who stay at home or in the nursing home and get their treatment. Another explanation can be the fact that patients with a higher level of functioning live independently and decide what they want to eat and drink, and patients with a low level of functionality are dependent on what is served. The group of rehospitalised patients also had a higher LOS at the initial admission compared to patients not rehospitalised. Although, except for the Barthel-20 score, there was no significant difference according to the CCI, handgrip strength, dementia, admission from nursing home.

One-year mortality is high in patients with OD (Carrión et al., 2015; Rofes et al., 2010), and this study equals these results with a 1-year mortality of 71.7% for patients with CAP and OD. Patients who died had a significantly higher Charlson Comorbidity Index, age and weaker handgrip, and these parameters are related to frailty and overall cause of death (El Solh, Pineda, Bouquin, & Mankowski, 2006; Leong et al., 2015).

5. Limitations and strengths

The limitation of the study is that the small sample size can lead to a type II error, as well as less precise estimates, which may be the case in this study, illustrated by the width of the confidence intervals. The strength of the study is that the patients were included consecutively.

The used assessment of OD is also a limitation. We used a standardized bedside screening tool as recommended in the National Guideline for Assessment of Dysphagia (Danish Health Authority, 2015). V-VST is a validated and recommended bedside screening tool (Kertscher, Speyer, Palmieri, & Plant, 2014), but it has not yet been validated in Denmark. V-VST uses a decrease in oxygen saturation greater than or equal to 3% to detect silent aspiration. A fall in oxygen, as a fall in oxygen saturation, is not a reliable indicator of silent aspiration (Ramsey, Smithard, & Kalra, 2005). Pharyngeal residue is one of the signs of swallowing disorders, which can be visualized in a videofluoroscopy but is impossible to visualize in a bedside screening. However, in our clinical setting, it was not possible to use the objective assessments video fluoroscopy or fiberoptic endoscopic evaluation of swallowing.

More factors like social relationships, family interactions and environments may influence the end of life care decisions and this may have impacted on outcome (Sagha Zadeh et al., 2017). In this study, these factors have not been explored.

Finally, the definition of CAP remains vague and unclear, and there is a risk that some of the patients were hospitalised with aspiration pneumonia (Komiya, Ishii, & Kadota, 2014; Marik, 2001).

Results of this study demonstrate that patients with OD and CAP have a high frequency of rehospitalisation and that the long-term mortality is very high (71.7%) for patients hospitalised with CAP and OD. The group of patients rehospitalised has a significantly higher level of functionality than patients' not rehospitalised do. Patients who died 31–360 days after discharge had a significantly higher frequency of comorbidity and a weaker handgrip than patients who stayed alive. There is a big discrepancy between this high mortality and the resources dedicated to assessing and treating OD.

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Competing Interests
The authors declare no competing interest.

Author details
Dorte Melgaard[1,2]
E-mail: dmk@rn.dk
ORCID ID: http://orcid.org/0000-0002-5656-402X
Ulrik Baandrup[1,2]
E-mail: Utb@rn.dk
Martin Bøgsted[2,3]
E-mail: martin.boegsted@rn.dk
Mette Dahl Bendtsen[2,3]
E-mail: m.bendtsen@rn.dk
Tina Hansen[4]
E-mail: ergotp.tina@gmail.com
[1] Center for Clinical Research, North Denmark Regional Hospital, Hjørring, Denmark.
[2] Department of Clinical Medicine, Aalborg University, Aalborg, Denmark.
[3] Department of Hematology, Aalborg University Hospital, Aalborg, Denmark.
[4] Department of Physical and Occupational Therapy, Metropolitan University College, Copenhagen, Denmark.

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